IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Tuija HURTTA .	Group Art Unit: Unassigned
Application No.: New Application	Examiner: Unassigned
Filed: March 26, 2004	Attorney Dkt. No.: 59643.00384

For: CONTROL DECISIONS IN A COMMUNICATION SYSTEM

CLAIM FOR PRIORITY UNDER 35 USC § 119

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450   March 26, 2004

Sir:

The benefit of the filing date of the following prior foreign application filed in the following foreign country is hereby requested for the above-identified patent application and the priority provided in 35 U.S.C. §119 is hereby claimed:

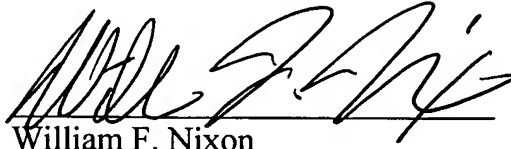**Patent Application No. 0329502.9 filed on** December 19, 2003 **in Great Britain**

In support of this claim, a certified copy of said original foreign application is filed herewith.

It is requested that the file of this application be marked to indicate that the requirements of 35 U.S.C. §119 have been fulfilled and that the Patent and Trademark Office kindly acknowledge receipt of this document.

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Enclosure: Priority Document (1)

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1. Your reference	304570GB/JPR/nm	19 DEC 2003

2. Patent application number *(The Patent Office will fill in this part)*	**0329502.9**

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*	NOKIA CORPORATION KEILALAHDENTIE 4 FIN 02150 ESPOO FINLAND
Patents ADP number *(if you know it)*	
If the applicant is a corporate body, give the country/state of its incorporation	FINLAND ˥ 765221700I

4. Title of the invention	CONTROL DECISIONS IN A COMMUNICATION SYSTEM

5. Name of your agent *(if you have one)* "Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	PAGE WHITE & FARRER 54 Doughty Street, London WC1N 2LS, United Kingdom
Patents ADP number *(if you know it)*	1255003

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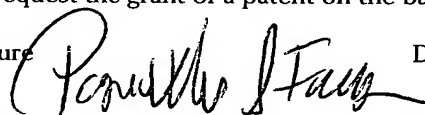   Request for preliminary examination
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11.   I/We request the grant of a patent on the basis of this application.

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CONTROL DECISIONS IN A COMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION:

Field of the Invention:

5

The present invention relates to communication systems, and in particular to a step of deciding how to control communications via a gateway. The decision may relate to control operations such as authorization and policy control
10 applied to communications routed via a gateway.

Description of the Related Art:

A communication system can be seen as a facility that enables
15 communication between two or more entities such as user equipment, servers, gateways and/or other nodes. The communication may comprise, for example, communication of voice, data, multimedia and so on. A communication system may enable a user thereof to be provided with various types of
20 services. For example, a user equipment may be in communication with an application server (AS), such as a service provider server, via a communication system.

The term "service" used above and hereinafter will generally
25 be understood to broadly cover any service which a user may desire, require or be provided with by means of the communication system. The term also will generally be understood to cover the provision of complimentary services. In particular, but not exclusively, the term "service" will
30 be understood to include browsing, downloading, email, streaming services, Internet Protocol multimedia (IM) services (IMS), conferencing, telephony, gaming, rich call,

presence, e-commerce and messaging, for example, instant messaging.

Signalling between various entities associated with a
5   communication session is typically required in order to control the communication session. Control is typically required for the set-up of the communication session and also later on during communication on the established session. The signalling can be based on an appropriate communication
10   protocol or protocols.

The communication may be provided by fixed line and/or wireless communication interfaces. An example of the fixed line system is a public switched telephone network (PSTN).
15   The wireless communication may be provided by means of a mobile communication system. Another example of the wireless communication systems is the Wireless Local Area Network (WLAN). Mobile communications systems refer generally to any telecommunications systems which enable a wireless
20   communication for users who may move within the service area of the system. An example of a typical mobile communications systems is a Public Land Mobile Network (PLMN).

A wireless communications system is typically provided with a
25   plurality of access networks. The access networks are for providing a user with a wireless access to the core network part of the communication network. An access network typically comprises at least one base station system and a radio network controller functionality. The access network
30   may be configured to provide a packet service for mobile user equipment via the base stations.

The mobile communication network may then be used for access
to other destinations, such as other networks, hosts,
services offered by specific service providers and so on.
Such an access is provided by nodes commonly referred to as
5   access points. Typically an access point or gateway node of
the mobile communication network provides further access to
an external network or an external host. For example, if the
requested service is provided by a service provider located
in another network, the service request is routed via a
10   gateway to the other network and the service provider. The
routing may be based on definitions in the mobile subscriber
data stored in the mobile network.

A user may need to be a subscriber to the communications
15   system in order to be able to use services provided by means
of the communication system. Subscriber data is typically
stored in a subscriber database for each subscriber. The
database is commonly controlled by the operator of the
networks providing the access service. The subscriber data
20   may comprise information regarding the quality of service
(QoS) the subscriber is entitled to receive, priorities,
service restrictions, security, authentications, charging and
so on.

25   Various different communication standards and protocols have
already been developed. New standards and protocols are also
continuously developed. To distinguish the earlier
developments from the more recent developments, the mobile
communication standards are divided in different generations.
30   For example, some standards, such as the first digital
cellular standards, are referred to as the second generation
(2G) standards while the more recent developments of the

digital mobile telephony are often referred to as the third generation (3G) standards.

The access networks the user may use to access services may
5 support substantially different features, depending on the standard used and/or the generation/version of the standard. Furthermore, user may use access networks that are based on unlicensed radio or fixed access techniques. Such access techniques may support substantially different features,
10 depending on the standard, and the manner the individual access systems are built and how these access system are connected to a backbone network. It shall be appreciated that unlike the well standardised cellular mobile systems, there are no strict and/or commonly accepted standards for
15 the unlicensed access systems. For example, public Wireless Local Area Networks (WLAN), residential WLAN, and enterprise WLAN can each be technically considered as being a different access network type. Also, public WLAN access networks for different types of hotspots may be considered as different
20 access network types. For example, different type of WLAN access networks may be provided in hotels in general than in a specific hotel or hotel chain, and so on.

A more detailed example of the possible problems that may be
.25 caused by differences between access network types is described below with reference to the general packet radio service (GPRS).

A GPRS based communication system is an example of wireless
30 communication systems that provide packet-switched data transmission for a mobile user equipment. The GPRS operational environment comprises one or more service areas,

which are interconnected by a GPRS backbone network. A
service area may comprise a number of packet data service
nodes (SN). In this specification the service nodes will be
referred to as serving GPRS support nodes (SGSN). Each of the

5 SGSNs is connected to at least one radio access network. The
access networks may be either 2G or 3G access networks.

The packet data serving nodes are in turn connected to an
external data network, e.g. to a public switched data network

10 (PSPDN), via appropriate gateways, such as GPRS gateway
support nodes (GGSN). The GPRS thus allow transmission of
packet data between mobile user equipment and external data
networks.

15 An example of the data bearers that may be used to carry the
traffic flows over the GPRS is a packet data protocol (PDP)
context. A PDP context typically includes a radio access
bearer provided between the user equipment, the radio network
controller and the SGSN, and switched packet data channels

20 provided between the serving GPRS service node (SGSN) and the
gateway GPRS service node (GGSN). A session between the user
equipment and other party would then be carried on the
established PDP context. A PDP context can carry more than
one traffic flow, but all traffic flows within one particular

25 PDP context are treated in the prior art the same way as
regards their transmission across the network. The
requirement regarding similar treatment is based on PDP
context treatment attributes associated with the traffic
flows. These attributes may comprise, for example, quality of

30 service and/or charging attributes.

Some features associated with a service flow may need to be controlled by the gateway. Gateway may need to apply control to a traffic flow when setting up a data bearer. Control may also need to be applied to a traffic flow on an already

5   established data bearer. The control is based on so called policy. In brief, a policy can be seen as a set of rules how the traffic flow shall be controlled.

Differences in the type of the access networks may cause

10   problems in certain situations. A problem may be caused by the lack of information regarding the access network at the gateway. This may make it impossible for the gateway to appropriately provide control of traffic flows between the different networks it interfaces. A particular problem

15   relates to service specific control of features such as Quality of Service (QoS), security, charging, access control and so on.

SUMMARY OF THE INVENTION:

20

Embodiments of the present invention aim to address one or several of the above problems.

According to one embodiment of the invention, there is

25   provided a method of deciding a policy for controlling communications in a communication system. The method comprises determining the type of an access network associated with communications via a gateway. In a further step a policy to be applied to communications via the gateway

30   is decided based on information regarding the type of the access network.

According to another embodiment of the present invention there is provided a communication system comprising different access networks and a gateway configured for communication with entities associated with different access networks. The communication system comprises access network type determination means configured to determine the type of an access network and a decision making entity configured to decide a policy that is to be applied to communications via the gateway based on information of the type of an access network. The communication system is configured such that the gateway is configured to control communications based on decisions by the decision making entity.

According to yet another embodiment of the present invention there is provided a gateway configured for communication with entities associated with different access networks of a communication system. The gateway comprises an access network type determining means configured to determine the type of an access network. The gateway also comprises a decision making means configured to decide a control policy that is to be applied to communications via a gateway based on information of the type of an access network. The gateway is configured to control traffic flows based on decisions by the decision making means.

The embodiments of the invention may enable access specific control of service provisioning in a communication system. Flexibility of the communication systems may be improved. Operational costs of a communication system may be reduced. The embodiments may improve operation during an handover or other change of access network.

BRIEF DESCRIPTION OF THE DRAWINGS:

For better understanding of the present invention, reference will now be made by way of example to the accompanying

5   drawings in which:

Figure 1 shows schematically a communication system wherein the present invention may be embodied;

Figures 2 and 3 show signalling flowcharts in accordance with some exemplifying embodiments of the present invention;

10   and

Figure 4 is a flowchart illustrating the operation of an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS:

15

Certain embodiments of the present invention will now be described by way of example with reference to the architecture of a GPRS based mobile communications system shown in Figure 1. However, it shall be understood that

20   embodiments of the invention are applicable to any other suitable form of networks as well.

A mobile communication system may logically be divided between a radio access network (RAN) and a core network (CN).

25   In the simplified presentation of Figure 1, each base station 31 to 34 and 48 belongs to a radio access network. A radio access network (RAN) may be controlled by appropriate radio network controller (RNC), a base station controller (BSC) or similar. This is not shown in order to enhance clarity. A

30   radio access network controller is typically connected to an appropriate core network entity or entities such as, but not limited to, a serving general packet radio service support

node (SGSN) 35 and 45. It shall be appreciated that, although, for clarity, Figure 1 shows only few base stations, typically the nodes of a core network are connected to a number of base stations via an appropriate controllers.

5

A user equipment within a radio access network may communicate with a radio network controller via radio network channels which are typically referred to as radio bearers (RB). These radio network channels may be set up in a mobile

10 telecommunications network in a known manner. Each user equipment 30 may have one or more radio network channels open at any one time with the radio network controller. The relevant radio access network controller is in communication with the serving GPRS support node 35 via an appropriate

15 interface, for example on an Iu interface.

The serving GPRS support node 35, in turn, typically communicates with a gateway GPRS support node 40 via the GPRS backbone network on interface 39. This interface is commonly

20 a switched packet data interface. The serving GPRS support node 35 and/or the gateway GPRS support node 40 are for provision of support for GPRS services in the network.

A subscriber database entity 36 for storing information

25 associated with the subscriber of the user equipment 30 is also shown. The subscriber database may contain various records 38 associated with the subscriber, such as details of a PDP context subscription of the subscriber of the user equipment.

30

The basic operational principles of a mobile user equipment, that may also be referenced to as a mobile station, are

generally known by those skilled person. A mobile user
equipment is normally configured for wireless communication
with other stations, typically with the base stations of a
mobile communication system for enabling mobility thereof. A

5   mobile· user equipment may include an antenna element for
wirelessly receiving and/or transmitting signals from and/or
to the base stations of the mobile communication network. A
mobile user equipment may also be provided with a display for
displaying images and/or other graphical information for the

10   user of the mobile user equipment. Speaker means are also
typically provided. The operation of the mobile user
equipment may be controlled by means of an appropriate user
interface, such as control buttons, voice commands and so on.
Furthermore, a mobile station is typically provided with a

15   processor entity and/or a memory means. Communication between
the mobile user equipment and the entities of the
communication network may be based on any appropriate
communication protocol. A user may use the mobile user
equipment for tasks such as, but not limited to, for making

20   and receiving phone calls, for receiving and sending data
from and to the network and for experiencing, for example,
multimedia content by means on PDP contexts. For example, a
user may access the network by means of a Personal Computer
(PC), Personal Data Assistant (PDA), mobile station (MS) and

25   so on.

It shall be appreciated that, although for clarity, only one
equipment is shown in Figure 1, a number of user equipment
may be in simultaneous communication with a base station.

30

Overall communication between user equipment 30 in an access
network and the gateway GPRS support node 40 may be provided

by a packet data protocol (PDP) context. Each PDP context usually provides a communication pathway between a particular user equipment and the gateway GPRS support node 40. Once established, a PDP context can typically carry multiple

5   flows. Each flow normally represents, for example, a particular service and/or a media component of a particular service. The PDP context therefore often represents a logical communication pathway for one or more flows across the network. To implement the PDP context between user equipment

10   30 and the serving GPRS support node 35, radio access bearers (RAB) are usually established which commonly allow for data transfer for the user equipment. The implementation of these logical and physical channels is known to those skilled in the art and is therefore not discussed further herein.

15

It shall be appreciated that other access networks, for example non-cellular access networks, may also be used for establishing a client access bearer between the user equipment 30 and the gateway GPRS support node 40. Such a

20   client access bearer shall be understood as being an equivalent to a PDP context since it also provides a logical communication pathway across the network. For example, in WLAN access or fixed broadband access networks, a client access bearer may be realized by means of Virtual Private

25   Networking (VPN), Point-to-Point Protocol (PPP), or Mobile IP technology.

The user equipment 30 may connect, via access to the GPRS network, to servers that are generally connected to an

30   external data network such as, but not limited to, the exemplifying Internet Protocol (IP) network 50.

A policy control entity 52 interfacing with the gateway 40 is also shown. The policy controller may be provided by any appropriate network entity. For example, the policy control entity may be provided by means of a combined authorization

5   and policy control node. An IP Session Control (IPSC) node or a policy decision function (PDF) may also be employed for this purpose. The policy control entity 52 may be provided with a database 54 for storing information required for making service specific authorization and policy decisions.

10

In the embodiment of Figure 1 the gateway 40 is provided with an access network type determining means 41. In the preferred embodiment the type determination means comprise an appropriate software code product running on a processor

15   provided in the gateway 40. Possible configurations of the determination means 41 and the function thereof will be described below in more detail.

Figure 1 shows also a subscription manager entity 56

20   connected to the policy control entity 52. The subscription manager may be provided by means of a directory server or any other appropriate database configured to store information associated with the services available for the subscriber. For example, the subscription manager may contain information

25   regarding services that are allowed for a certain subscriber or a group of subscribers. The subscription manager 56 may store in a database 57 thereof information such as indications if a subscriber is allowed to browse the web, send and receive emails, receive content from application

30   servers and so on. As shown by Figure 1, the subscription manager 56 may be a different entity from the subscriber database 38 associated with the access network.

In the embodiments information regarding the relevant access network type may be used as a criteria when making authorization and policy decisions. A policy to be decided

5   may be e.g. a QoS policy, a security policy, a charging policy, a chained service policy, and so on, or a policy covering an appropriate combination of various policies.

Figure 2 shows a flowchart in accordance with an embodiment

10   of the present invention. In step 100 a node associated with the access network signals data associated with an access bearer or a service flow to a gateway. The node may be, for example an SGSN or a user equipment. The data may be signalled in a message from the SGSN or the user equipment to

15   the gateway. The message may be a request for a data bearer or any other message associated with the control of data bearer. At step 102 the gateway may determine the type of the node. For example, it may need to be determined if the node associated with the access network supports only one of 2G

20   and 3G standards or a WLAN standard. Once the type of the node is known, the type of the access network the user equipment is attached to may be determined based on this information.

25   The determining means 41 may be configured to determine the access network type based on, for example, information received from a packet data node associated with the access network, such as a SGSN or wireless access gateway (WAG). In accordance with an embodiment, the gateway may determine the

30   type of the access network based on information received from the user equipment. The information may include a type indicator included in a message. Rather than using

information received from the access network, the decision may also be based on information otherwise available for the gateway.

5   For example, if it is possible to have either a 2G or a 3G based access system, a SGSN may indicate in a message, for example in a request for a data bearer, whether it is a 2G or 3G SGSN. According to a possibility the gateway may derive the 2G/3G information from the address of the SGSN. In a

10   similar manner, the gateway may determine that the access network is a WLAN based access system based on an indication by the network node sending message or based on the address of the network node. The gateway may also derive the access network type from the characteristics of a message from the

15   network node or user equipment. For example, the determination of the access network type may be based on the format or protocol of a message received from the access network. The access network type may also be derived based on information of the physical port through which the gateway

20   received the message. According to a possibility the user equipment may explicitly indicate the access network type to the gateway. The gateway may also derive the access network type from the address of the user equipment. These possibilities may in particular be applicable to but not

25   limited to WLAN based access.

Once the type is determined, a decision is made in step 104 regarding the service specific policy that is to be applied to the data bearer and/or service flow or flows. In step 106

30   the gateway then applies control to the data bearer and/or traffic flow or flows in accordance with the decision made at step 104.

It shall be appreciated that the decision may be made in relation to a traffic flow on a data bearer that has been established a while ago. The traffic flow may be a new

5   traffic flow on that data bearer, or some of the parameters associated with the traffic flow may have changed. For example, the user equipment may have moved to another access network.

10 The following describes in more detail two exemplifying embodiments with reference to signalling flowcharts of Figures 3 and 4.

Figure 3 shows a signalling flowchart for a possible access
15 bearer establishment procedure. In the example a gateway 40 receives message 1 requesting for an access bearer establishment, for example for activation of a PDP context or a client access bearer.

20 The gateway 40 may determine at this stage whether authorization and policy control is required. This may be based on a list of access points that require/do not require authorization and policy control. If authorization and policy control is deemed as being required, the gateway 40 may
25 resolve the address of an appropriate policy control entity e.g. based on a pre-defined policy controller address information. The policy control entity address may be stored in the gateway per each access point. Instead of storing this information in the gateway, the address information may be
30 fetched from an external database. The address information may be contained in the list or other record used for storing

an indication if the authorization and policy control is required in the first place.

The gateway 40 sends then a request message 2 to the policy
5 control entity 52. The message may include information such as identity of the user/subscriber, access point (AP), type of the access network, and so on.

As mentioned above, the access network type may be determined
10 based on various information. For example, a SGSN or a user equipment may include an indication of the access network type in message 1.

The policy control entity 52 may then use the information
15 sent by the gateway 40 to derive information for authorization and policy control decision making.

If the subscription profile is not available in the policy control entity 52, the policy control entity may determine
20 whether it is possible that a subscriber profile is available in a subscriber manager 56 containing a subscription directory (SD). In case of home subscribers, the policy control entity 52 may send a Search Request message 3 to the subscriber manager to retrieve the subscription profile. If
25 there is no subscription profile available (e.g. in case of visiting subscribers), default subscription profile may be used instead.

If information is requested from the subscriber manager, the
30 request may be responded by a Search Response (Subscription Profile) message 4. The subscription profile may include access specific attributes for each authorized access point

and/or service, e.g. a 2G/3G/WLAN QoS policy, a 2G/3G/WLAN
security policy and/or a 2G/3G/WLAN charging policy.

The policy control entity 52 may want the subscriber manager
5   to send notifications on changes in the subscription profile.
If this is to be used, the policy control entity may send a
'Modify Request' message 5 to the subscriber manager. This
message may include information such as user equipment
identity, the address of the policy control entity, and an
10 'Add Address' command. The subscriber manager may then reply
message 5 by sending a 'Modify Response' (Status) message 6
to the policy control entity.

The policy control entity 52 may perform an authorization and
15 policy decision by using the access network type as one
decision criteria. The policy control entity may send a
decision message 7 to the gateway 40.

Examples of parameters included in the decision are
20 parameters such as 'Subscription Identity', 'Allowed
Services', 'Access Bearer Charging Policy', Access Bearer QoS
Policy', 'Service Flow Chained Services', 'Service Flow
Chained Service Policies', 'Service Flow Charging Policy',
'Service Flow QoS Policy', and so on. From these parameters
25 the 'Subscription Identity' may be used to identify the
subscription. The 'Allowed Services' may indicate the
services which are allowed on the access bearer. The 'Access
Bearer Charging Policy' may indicate how the access bearer is
to be charged. The charging policy may be indicated to be,
30 for example, one of 'online', 'offline with time reporting',
and 'offline with volume reporting'. The 'Access Bearer QoS
Policy' parameter may indicate maximum values for the Quality

of Service (QoS) Class and bitrates of the access bearer. The 'Service Flow Chained Services' parameter may indicate which data processing functions to be performed for the service flow and in which sequence. The 'Service Flow Chained Service

5 Policies' parameter may indicate policies for the data processing functions to be performed for the service flow. The 'Service Flow Charging Policy' parameter may indicate how the service flow is to be charged (e.g. online / offline with time reporting / offline with volume reporting). The 'Service

10 Flow QoS Policy' may indicate max values for the QoS Class and bitrates of the service flow.

A decision may also contain policies for multiple service flows. For example, one set of policies may be for a service

15 flow 1 and another set of policies may be for a service flow 2.

For each access bearer and/or service flow, an access specific QoS policy, an access specific charging policy,

20 access specific information on chained services and access specific policies for the chained services may be included if the policy is personalized for the subscription and if further control by the policy control entity is not required. If further control by policy control entity is required for

25 any of the policies, a policy control entity controlled flag may be included instead of the policy.

It shall be appreciated that the policy control entity 52 may send either policies relevant for the access network type or

30 policies for all access network types to the gateway. In the latter approach it may not be necessary to indicate the access network type from the gateway to the policy control

entity in message 2. In the latter approach, the gateway may use the access network type to determine the policies to be enforced.

5 Access specific policies which are not personalized for the subscription may be configured to the gateway. If the gateway does not receive a policy from the policy control entity, it may then apply as a default a policy which is configured to the gateway.

10

The policy decision by the policy control entity 52 is sent to the gateway 40 in message 7. The gateway enforces the policy decision in the provisioning of the service.

The gateway may send a 'Report State (Status)' message 8 to

15 the policy control entity. This may be simply an indication if the policy has been enforced successfully.

The gateway may then acknowledge the access bearer establishment in message 9 to the SGSN, thus completing the

20 access bearer establishment procedure from its behalf.

It shall be appreciated that although Figure 3 shows an embodiment wherein the policy decision is made at an external policy control entity 52, it is possible for the gateway

25 itself to decide the policy to be applied to a specific access bearer and/or service flow. The gateway may be provided with appropriate software and hardware to provide the decision making functions. The decision making may be integrated with the determination means 41 of Figure 1.

30

Figure 4 shows an example for policy control for an already existing service flow. This type of operation may be required

for example if different service flows have been assigned with different service flow policies, or if the service flow policy is not decided when the access bearer is established.

5 In step 11 the gateway identifies a service flow. The gateway may then determine that (one or more) policies for the service flow are not available in the gateway. A further control by a policy control entity is thus determined as being required for the service flow. The gateway may then

10 resolve the address of the policy control entity e.g. by using pre-defined address information. The gateway may map the packet filter of the service flow into a service flow name and sends a Request message 12 to the policy control entity. Message 12 may include parameters such as 'Service

15 Flow Name', 'Access Network Type'. The 'Access Network Type' parameter may be used to indicate if the user equipment has accessed the service via e.g. a 2G, 3G, or a WLAN access network.

20 The policy control entity may have stored the access network type when providing the first decision to the gateway, as described above with reference to the access bearer establishment. In this case, it is not necessary to indicate the type of the access network anymore when requesting

25 policies for a service flow.

The policy control entity may use the name of the service flow or other service flow identity sent by the gateway to derive attributes from the subscription profile stored at

30 access bearer establishment. The policy control entity performs a policy decision procedure and sends the decision in message 13 to the gateway. The decision regarding the

service flow policies may include any access network specific policies which were not provided to the gateway at access bearer establishment.

5   The policy control entity may send only such policies that are relevant for the specific access network type. Alternatively, policies for all access network types may be sent to the gateway. If the latter approach is selected, it is not necessary to indicate the type of the access network
10   to the policy control entity in message 12. In the latter approach, the gateway may use the access network type to determine the policies to be enforced.

The gateway then enforces the policy decision.
15

The gateway may send a 'Report State (Status)' message 14 to the policy control entity.

A third use example relates to handover from an access
20   network of a first type to an access network of another type. For example, a user equipment may be handed over from a 2G access network to a 3G access network, or between a WLAN access network and a 2G or 3G access network. The handover may be controlled by the network, by the user equipment, or
25   by both. Information about the handover may be signalled to the gateway either by a network node or by a user equipment. The gateway may derive the new access network type by means of methods described above for deriving access network types. If the access network type changes this may trigger
30   authorization and/or policy control for an already existing access bearer and/or service flow, as shown in Figure 3 such

that the new access network type is indicated in step 2 of Figure 3. The same may apply for step 12 of Figure 4.

5   It shall be appreciated that the signalling step 100 of Figure 2 may not always be necessary. For example, a gateway may be able to determine the type of an access network based on other information without any signalling from other nodes. For example, the gateway may be provided with a GPRS access point, this being an indication that the access network type

10   is GPRS, a WLAN access point this being an indication that the access network type is WLAN, a circuit switched (CS) data access point, this being an indication that the access network type is CS Data, and so on.

15   It should be appreciated that whilst embodiments of the present invention have been described in relation to user equipment such as mobile stations, embodiments of the present invention are applicable to any other suitable type of user equipment.

20

It shall be appreciated that the embodiments may be applied to any gateway, for example a Packet Data gateway of WLAN (wireless Local Area Network) access, a Packet Data Serving Node of CDMA access, a Network Access Server of Circuit

25   Switched Data (CSD) access, or a Broadband Remote Access Server (BRAS) or Digital Subscriber Line Access Multiplexer (DSLAM) of fixed broadband access.

The detailed examples are given in the context of data

30   bearers such as PDP contexts. Any suitable data carriers, for example PPP sessions, client VPN connections, or Mobile IP connections may be controlled accordingly.

The embodiments of the present invention are described above in the context of a communication system that is based on a GPRS backbone. This invention is also applicable to any other

5   communication systems where similar problems may exist.

In addition, the term policy controller entity is intended to cover all controller entities configured to control provision of services in systems wherein services can be provided for

10   users and/or wherein different entities associated with a session may have different service provisioning criteria.

It is also noted herein that while the above describes exemplifying embodiments of the invention, there are several

15   variations and modifications which may be made to the disclosed solution without departing from the scope of the present invention as defined in the appended claims.

Claims

1. A method of deciding a policy for controlling communications in a communication system, the method
5   comprising the steps of:

determining the type of an access network associated with communications via a gateway; and

deciding a policy to be applied to communications via the gateway based on information regarding the type of the
10   access network.

2. A method as claimed in claim 1, comprising the further steps of:

signalling data from an entity associated with an access
15   network to a gateway; and

determining the type of the access network based on said data.

3. A method as claimed in claim 2, wherein the step of
20   signalling data comprises sending type information from the entity to the gateway.

4. A method as claimed in claim 2 or 3, wherein the entity associated with the access network comprises a node connected
25   to the access network.

5. A method as claimed in claim 2 or 3, wherein the entity associated with the access network comprises a user equipment.

30

6.   A method as claimed in any of claims 2 to 5, wherein the step of signalling data comprises sending a request for a data bearer.

5   7.   A method as claimed in claim 6, comprising the step of including information regarding the type of the access network in a request for data bearer.

8.   A method as claimed in claim 6 or 7, wherein the request
10   comprises a request for creation of a packet data protocol context.

9.   A method as claimed in any preceding claim, wherein the step of determining the type of an access network comprises
15   determining the type in the gateway.

10.   A method as claimed in claim 9, wherein the step of determining comprises determining the type of an access network based on the address of an entity associated with the
20   access network.

11.   A method as claimed in claim 9, wherein the step of determining the type of an access network comprises the sub-steps of:
25   determining the access type supported by an entity associated with the access network; and
          determining the type of the access network from the access type supported by the entity associated with the access network.
30

12.   A method as claimed in claim 9, wherein the step of determining the type of the access network comprises

determining the type of the access network based on the
characteristics of a message signalled from an entity
associated with the access network to the gateway.

5   13.   A method as claimed in any preceding claim, comprising
the step of identifying a communication session by the
gateway.

14.   A method as claimed in claim 13, comprising the step of
10   checking in the gateway if a service specific policy is
already available for the identified communication session.

15.   A method as claimed in any preceding claim comprising
the further step of deciding if a decision by a policy
15   controller is required.

16.   A method as claimed in claim 15, comprising resolving by
the gateway the address of an appropriate policy controller
entity.
20

17.   A method as claimed in claim 15 or 16, comprising the
step of sending a request to the policy controller entity,
the request containing information regarding the type of the
access network.
25

18.   A method as claimed in any of claims 15 to 17,
comprising the further step of sending an enquiry for a
subscription profile from the policy controller entity to a
separate database.
30

19. A method as claimed in any of claims 15 to 18, comprising authorising a user and making a policy decision in the policy controller entity.

5   20. A method as claimed in any preceding claim, wherein the step of deciding a policy comprises selecting an access network specific policy.

21. A method as claimed in any preceding claim, comprising
10   determining if the access network operates in accordance with one of a second generation standard, a third generation standard, and Wireless Local Area Network standard.

22. A method as claimed in any preceding claim, wherein the
15   step of deciding a policy comprises deciding a service specific policy.

23. A method as claimed in any preceding claim, wherein at least one of the following policies is decided based on the
20   information of the type of the access network: a quality of service policy, a security policy, a charging rule.

24. A method of controlling communications via a gateway, comprising the step of deciding a control policy in
25   accordance with any of the preceding claims.

25. A computer program comprising program code means adapted to perform any of the steps of the preceding claims when the program is run on a computer.

30

26. A communication system comprising:
different access networks;

a gateway configured for communication with entities associated with different access networks;

access network type determination means configured to determine the type of an access network; and

5   a decision making entity configured to decide a policy that is to be applied to communications via the gateway based on information of the type of an access network, the communication system being configured such that the gateway is configured to control communications based on decisions by

10   the decision making entity.

27.   A communication system as claimed in claim 26, wherein an entity associated with the access network comprises a node connected to the access network.

15

28.   A communication system as claimed in claim 26, wherein an entity associated with the access network comprises a user equipment.

20   29.   A communication system as claimed in any of claims 26 to 28, comprising a policy controller entity configured to provide the decision making entity.

30.   A communication system as claimed in any of claims 26 to

25   28, wherein the decision making entity is provided in the gateway.

31.   A gateway configured for communication with entities associated with different access networks of a communication

30   system, the gateway comprising:

an access network type determining means configured to determine the type of an access network; and

a decision making means configured to decide a control policy that is to be applied to communications via a gateway based on information of the type of an access network, the gateway being configured to control traffic flows based on decisions by the decision making means.

Abstract

A method of deciding a policy for controlling communications in a communication system is disclosed. The method comprises determining the type of an access network associated with communications via a gateway. In a further step a policy to be applied to communications via the gateway is decided based on information regarding the type of the access network. A network and a gateway embodying the method are also disclosed.
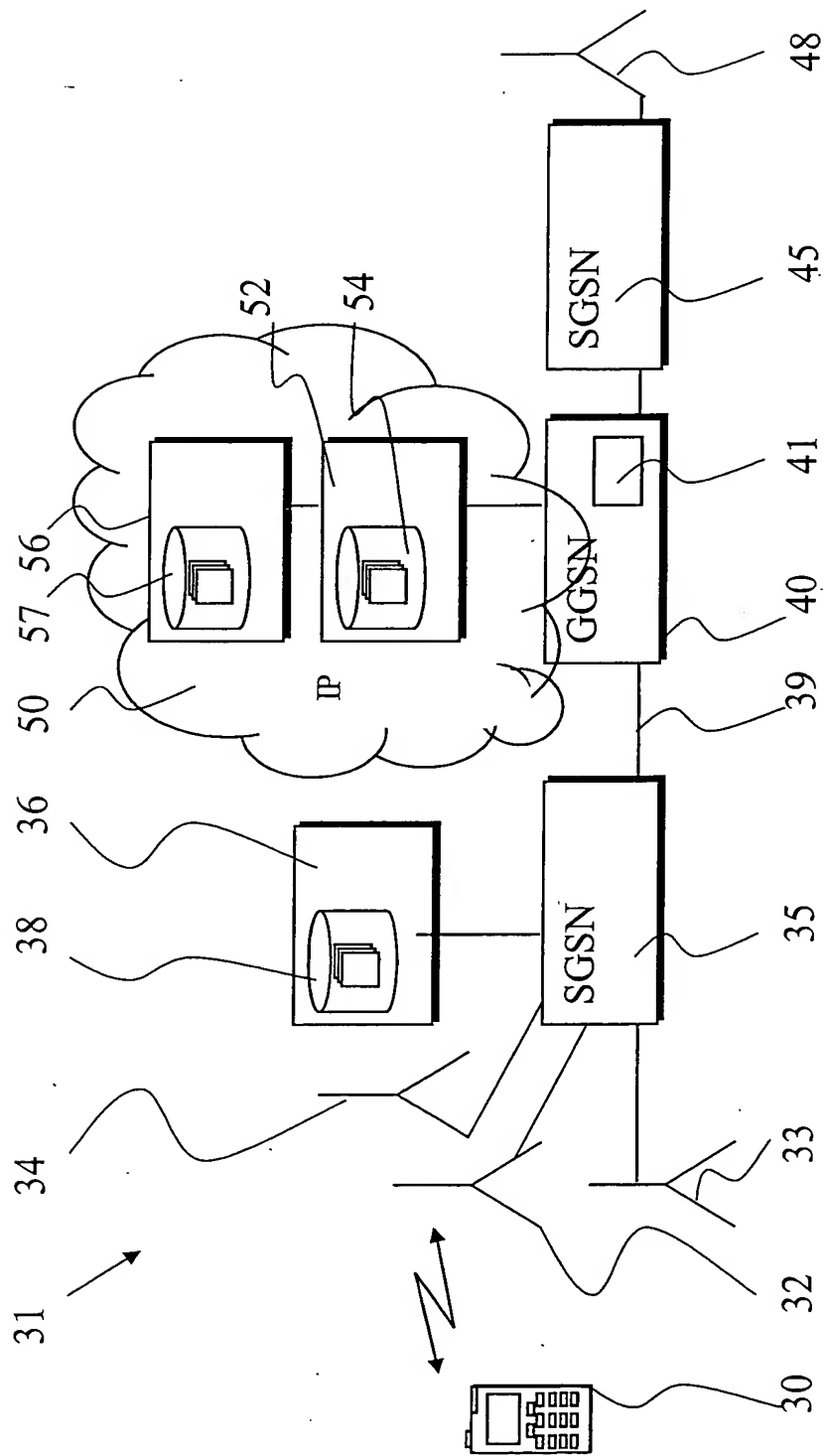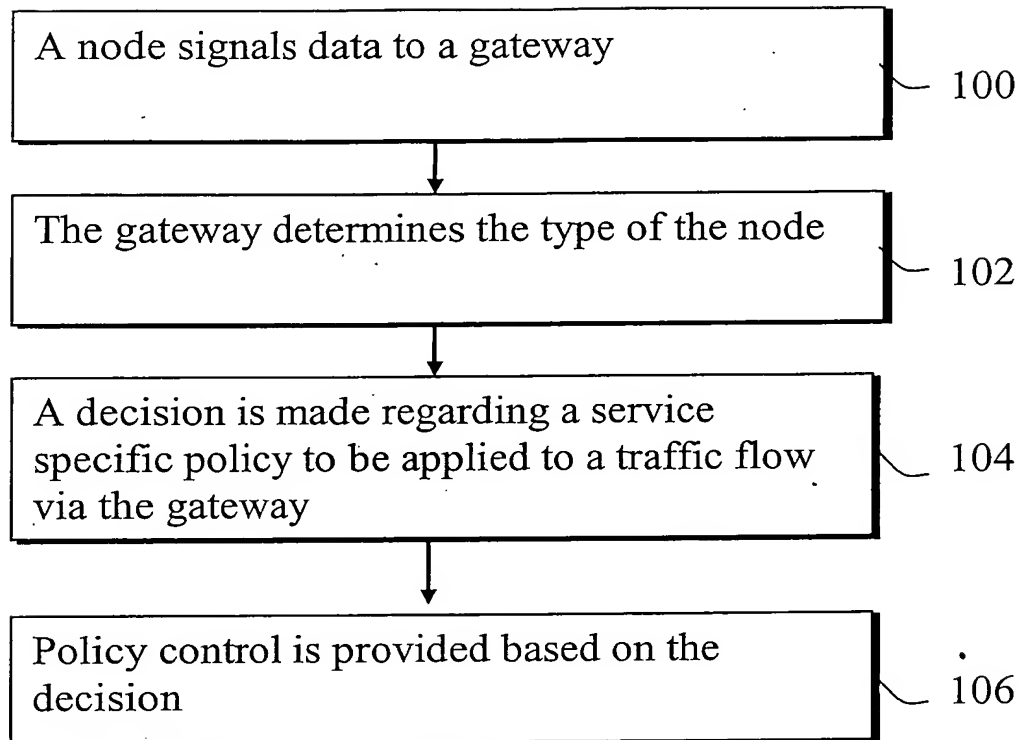
(Fig. 1)

Fig. 1

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┌─────────────────────────────────────────────┐
│                                             │
│   A node signals data to a gateway          │── 100
│                                             │
└─────────────────────────────────────────────┘
                      │
                      ▼
┌─────────────────────────────────────────────┐
│                                             │
│   The gateway determines the type of the node│── 102
│                                             │
└─────────────────────────────────────────────┘
                      │
                      ▼
┌─────────────────────────────────────────────┐
│   A decision is made regarding a service    │
│   specific policy to be applied to a traffic flow│── 104
│   via the gateway                           │
└─────────────────────────────────────────────┘
                      │
                      ▼
┌─────────────────────────────────────────────┐
│   Policy control is provided based on the   │
│   decision                                  │── 106
└─────────────────────────────────────────────┘
```

Fig. 2

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Fig. 3

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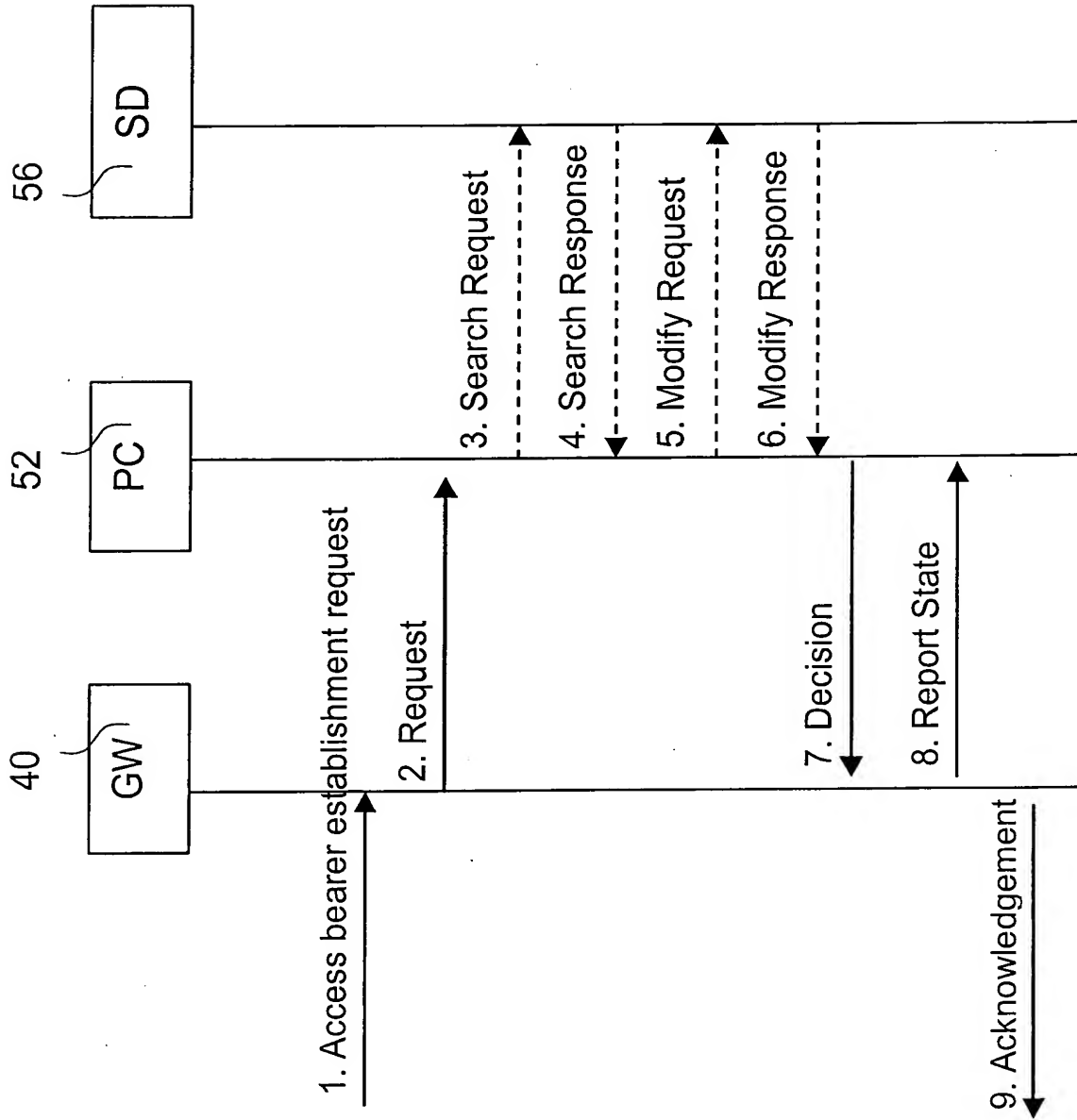
40

42

GW

PC

11. Service flow
identified

12. Request

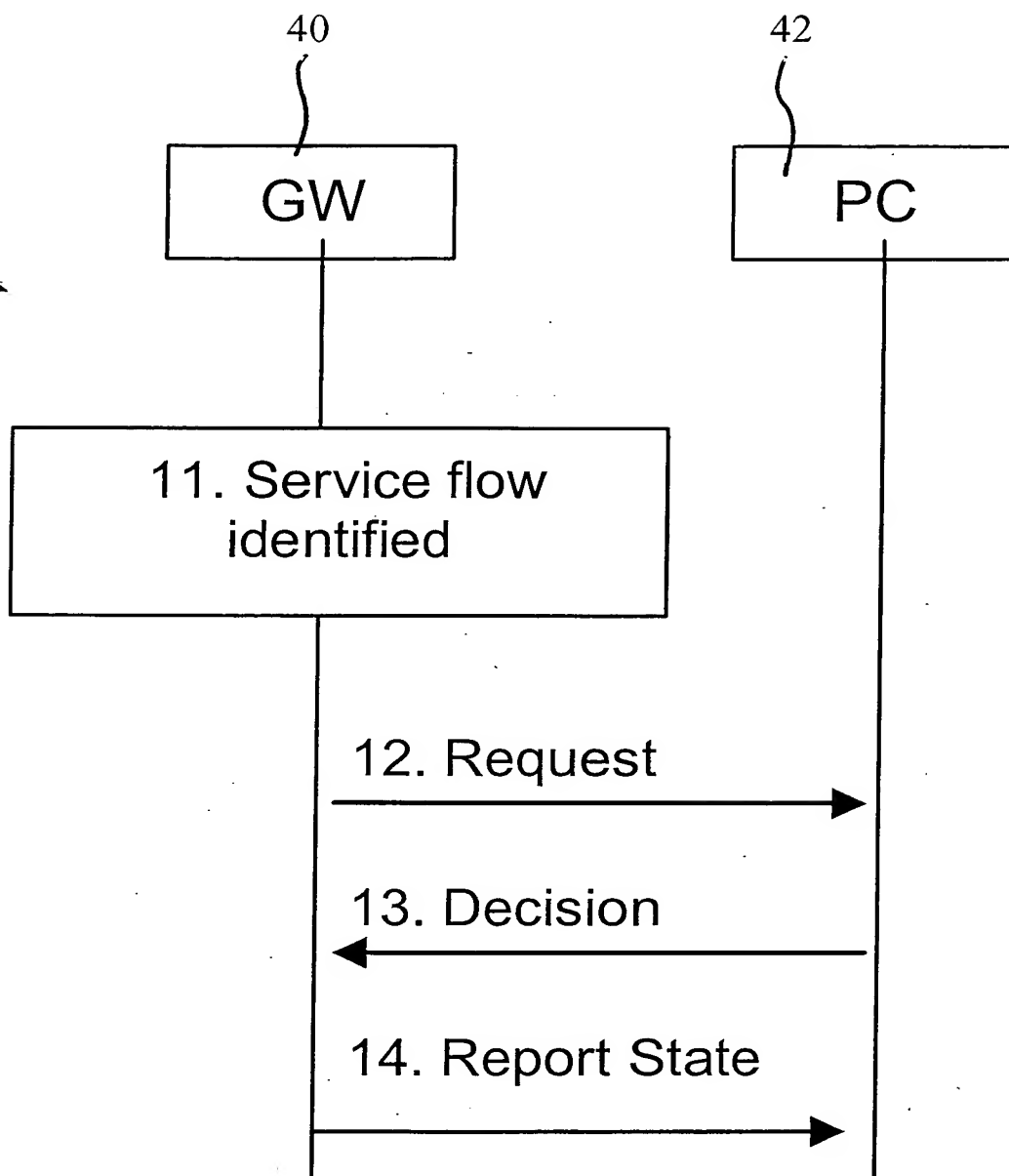13. Decision

14. Report State

Fig. 4

SQUIRE SANDERS & DEMPSEY L.L.P.
8000 Towers Crescent Drive, 14th Floor
Tysons Corner, Virginia 22182-2700

Docket No. 59643.00384
Serial No. New Application Filed: March 26, 2004
Group Art Unit: Unassigned